

Representation of visual and motor object features in human cortex Ariana M. Familiar, Heath Matheson, Sharon L. Thompson-Schill Department of Psychology, University of Pennsylvania

Introduction Left anterior temporal lobe (ATL) has been implicated in encoding integrated visual object features corresponding to object identity (e.g. shape/color; Coutanche & Thompson-Schill, 2015). Damage to bilateral ATL typically impairs memory of object features across sensory and motor modalities (Patterson, Nestor, & Rogers, 2007).

The present study tested whether ATL encodes integrated visual and motor object features corresponding to object identity.

Methods



Task: target object cued (2 s), then a series of pure-noise images presented (12-24 s), then object-in-noise (2 s) & response to whether object was the cued target or not. Grip



Objects employed uniquely defined by a combination of material, grip, and shape.

12 blocks per object across 4 runs (pseudo-random order)

GLM to estimate voxel responses during pure-noise timepoints (beta weights used as input in multi-voxel pattern analyses (MVPA))

Searchlight MVPA decoding:

- 4-way classification of object identity (unique combo. of material/shape/grip)
- 2-way classification of grip
- 2-way classification of material

ROI-based MVPA decoding:

• 2-way classification of shape

Statistical significance assessed with permutation procedures.



Results



Searchlight: grip decoding



Searchlight: material decoding





Mean classification accuracy: 55% (SEM = 0.04)

N = 24





Mean classification accuracy: 27% (SEM = 0.02)

Mean classification accuracy: 56% (SEM = 0.03)

Results

ROI: shape decoding



N = 24 Information selectivity Only successful classification of the given property (identity, grip, material, or shape) was found in each identified region.

Conclusions

- Identity classification was found in the right ATL as well as parietal (S2) and frontal (IFG) regions. Former work has related these areas to tactile object recognition, object manipulation, and action planning (e.g. Gallivan et al., 2013; Reed, Shoham & Halgren, 2004)
- Successful grip decoding was found in motor planning (PMA) and action-related (IPL) regions
- Successful material decoding was found in visual (PHG) and insular regions
- Successful shape decoding was found in a shape-selective visual region (LOC)
- Further analyses will test the dependence of identity decoding on simultaneous grip, material and shape decoding, on a block-by-block basis, to establish the convergence of these features in identity-coding areas.

References

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